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" Vous connaissez maintenant la méthode que j'ai proposé pour l'étude des protubérances, et dont Mr. Norman Lockyer avait eu l'idée, m'écrivit-on, depuis deux années. J'ignorais cela, et c'est une circonstance qui a été favorable à Mr. Lockyer; car si j'avais su qu'on travaillait sur ce sujet, naturellement j'aurais, en citant l'idée émise, fait connaître immédiatement par le télégraphe les résultats que j'obtenais dans l'Inde. Mais je ne regrette pas que Mr. Lockyer soit parvenu séparément à la confirmation de ses idées. Je trouve qu'il le méritait. Nous restons aussi indépendants l'un de l'autre.

" Je dois vous dire que je viens de découvrir que les protubérances se rattachent au soleil par une atmosphère dont l'hydrogène forme la base, au moins générale, et qui enveloppe la photosphère. Cette atmosphère est basse, à niveau fort inégal et tourmenté; souvent elle ne dépasse pas les saillies de la photosphère. Les protubérances ne paraissent être que des portions soulevées, projetées, détachées de cette enveloppe. J'étudie aussi les taches, sujet difficile, mais qui promet d'importantes notions sur la constitution du soleil.

" J'aurai l'honneur, à l'issue de ces études, d'envoyer un mémoire à votre Société Royale, comme hommage rendu à sa grande et juste célébrité, et aussi comme témoignage de reconnaissance des bonnes réceptions que j'ai eues dans l'Inde et chez vous toutes les fois que j'y vais.

" Mais, en attendant, je vous prie de vouloir bien lui communiquer les résultats dont je vous fais part ici.

" Je suis, en ce moment, à Simla, résidence d'été du Gouverneur, où j'ai un beau ciel et 8000 de vos pieds au-dessous de moi. Je profite de ces heureuses conditions pour aborder ici toutes sortes d'études.

" Je serai encore dans le Bengale en Mars. J'aurai donc le temps de recevoir une lettre de vous, ce qui me ferait un bien grand plaisir. Je n'ai ici aucune nouvelle scientifique d'Angleterre, et bien peu de France."

February 11, 1869.

Dr. W. B. CARPENTER, Vice-President, in the Chair.

The following communications were read:—

I. "On the Structure and Development of the Skull of the Common Fowl (*Gallus domesticus*)."
By W. KITCHEN PARKER,
F.R.S. Received November 25, 1868.

(Abstract.)

In a former paper (Phil. Trans. 1866, vol. clvi. part 1, pp. 113-183, plates 7-15) I described the structure and development of the skull in the Ostrich tribe, and the structure of the adult skull of the Tinamou—a bird which connects the Fowls with the Ostriches, but which has an essentially struthious skull.

That paper was given as the first of a proposed series, the subsequent communications to be more special (treating of one species at a time) and carrying the study of the development of the cranium and face to much earlier stages than was practicable in the case of the struthious birds.

Several years ago Professor Huxley strongly advised me to concentrate my attention for some considerable time on the morphology of the skull of the Common Fowl; that excellent advice was at length taken, and the paper now offered is the result.

A full examination of the earlier conditions of the chick's skull has cost me much anxious labour; but my supply of embryonic birds (through the kindness of friends)* was very copious, and in time the structure of the early conditions of the skull became manifest to me.

The *earliest* modifications undergone by the embryonic head are not given in this paper: they are already well known to embryologists; and my purpose is not to describe the general development of the embryo, but merely the skeletal parts of the head.

These parts are fairly differentiated from the other tissues on the fourth day of incubation, when the head of the chick is a quarter of an inch (3 lines) in length; this in my paper is termed the "first stage." The next stage is that of the chick with a head from 4 to 5 lines in length, the third 8 to 9 lines, and so on. The ripe chick characterizes the "fifth stage;" and then I have worked out the skull of the chicken when three weeks, two months, three months, and from six to nine months old, the skull of the aged Fowl forming the "last stage."

During all this time (from their first appearance to their highly consolidated condition in old age) the skeletal parts are undergoing continual change, obliteration of almost all traces of the composite condition of the early skull being the result—except where there is a hinge, for there the parts retain perfect mobility.

Here it may be remarked that although the Fowl is only an approach to what may be called a typical Bird, yet its skull presents a much greater degree of coalescence of primary centres than might have been expected from a type which is removed so few steps from the semistruthious Tina-mou, a bird which retains so many of its cranial sutures.

The multiplicity of parts in the Bird's skull at certain stages very accurately represents what is persistent in the Fish, in the Reptile, and to some degree in certain Mammals; but the skull at first is as simple as that of a Lamprey or a Shark, and, in the Bird above all other Vertebrates, reverts in adult age to its primordial simplicity—all, or nearly all, its metamorphic changes having vanished and left no trace behind them.

Although in this memoir I have no business with the Fish, yet all along I have worked at the Fish equally with the Bird, the lower type being taken as a guide through the intricacies of the higher; and here the Car-

* Dr. Murie is especially to be thanked for his most painstaking kindness in this respect.

tilaginous and the Osseous Fishes are never fairly out of sight. The Reptile, and especially the Lizard, has been less helpful to me, on account of its great specialization.

On the fourth day of incubation the cranial part of the notochord is two-thirds the length of the primordial skull, but it does not quite reach the pituitary body; it lies therefore entirely in the occipito-otic region. The fore part of the skull-base extends horizontally very little in front of the pituitary space; this arises from the fact that the "mesocephalic flexure" has turned the "horns of the trabeculae" under the head. Thus at this stage the nasal, oral, and postoral clefts are all seen on the under surface of the head and neck of the chick. At this time the facial arches have begun to chondrify; but only the quadrate, the Meckelian rod, and the lower thyro-hyal are really cartilaginous; the other parts are merely tracts of thickened blastema or indifferent tissue.

In the second stage an orbito-nasal septum has been formed; the "horns of the trabeculae" have become the "nasal alæ," and an azygous bud of cartilage has grown downwards between them; this is the "prænasal" or snout cartilage; it is the *axis* of the intermaxillary region. At the commencement of this second stage the primordial skull stands on the same morphological level as that of the ripe embryo of the Sea-turtle; at the end of this stage it has become struthious; and now parosteal tracts (the angular, surangular, dentary, &c.) appear round the mandibular rod.

In this abstract I shall not trace the changes of the skull any further, but conclude with a few remarks on the nomenclature of certain splints, and as to the nature of the great basicranial bones.

Some years ago I found that certain birds (for instance the Emeu) possessed an additional maxillary bone on each side; knowing that the so-called "turbinal" of the Lizard and Snake was one of the maxillary series, I set myself to find the homologies of these splints. Renaming the reptilian bones "prævomers," on account of their relation to the vomer, and supposing the feeble maxillaries of the Bird to represent them, I considered that the true maxillaries were to be found in those newly found cheek-bones of the Emeu and some other birds.

After discussion with Professor Huxley I have determined to drop the term "prævomer," and to call the supposed turbinal of the Lizard "septo-maxillary," and the additional bone in the Bird's face "postmaxillary."

In many Birds, but not in the Fowl, the "septo-maxillary" is largely represented—not, however, as a distinct osseous piece, but as an outgrowth of the true maxillary.

With regard to the basierianial bones, I have now satisfied myself that the "parasphenoid" of the Osseous Fish and the Batrachian reappears in the Bird as three osseous centres—all true "parostoses," as in the single piece of the lower types; these three pieces are, the "rostrum" of the basisphenoid and the two "basitemporals."

These three centres rapidly coalesce to form one piece, the exact counter-

part of the Ichthyic and Batrachian bone; but just as this coalescence begins, ossification proceeds inwards from these "parostoses," and affects the overlying cartilage, the cartilage of the basisphenoidal region having no other osseous nuclei. This process of the extension inwards of ossification from a splint-bone to a cartilaginous rod or plate I have already called "osseous grafting"*. In my former paper the basisphenoidal "rostrum" and "basitemporals" were classed with the endoskeletal bones; they will in the present paper be placed in the parosteal category, in accordance with their primordial condition.

By the careful following out of these and numerous other details I have corrected and added to my previous knowledge of the early morphological conditions of the Bird's cranium, and at the same time, I trust, have contributed to an enlarged and more accurate conception of the history and meaning of the Vertebrate skull in general.

II. "Determinations of the Dip at some of the principal Observatories in Europe by the use of an instrument borrowed from Kew Observatory." By Lieut. ELAGIN, Imperial Russian Navy. Communicated by BALFOUR STEWART, LL.D. Received February 2, 1869.

Before I give a short account of the observations and the results deduced from them, I beg to express in the first place my best thanks to Dr. Balfour Stewart, Director of the Kew Observatory, who, having heard of my desire to take the dip at different places, was so kind as to lend me an instrument from the Kew Observatory,—also to James Glaisher, Esq., F.R.S., &c., who furnished me with a tripod-stand, which I found to be of great use to me on some stations.

I may also remark that, having other duties to perform in obedience to instructions from the Russian Government, I could only devote a portion of my time to the observations of dip.

The instrument I had from Kew Observatory was one of Barrow's Dip-Circles, furnished with two $3\frac{1}{2}$ -inch needles in the form generally used at the Observatory. The Dip-Circle used had been in use for some time at the Kew Observatory, until, it having been ascertained that one of its needles was somewhat deteriorated, it was replaced with that now in use.

Before I left Kew Observatory I was aware that one of the needles was not as good as might be desired; but as Mr. Stewart had no other circle suitable for my purpose, I considered it desirable to take this circle.

The observations were made according to the instructions of Lieut-General Sabine, given in the 'Admiralty Manual of Scientific Enquiry.'

The following Table I. shows the results of the observations with the circle from Kew; in it the name of station and the date of observation are

* See memoir "On the Shoulder-girdle and Sternum," Ray Soc. 1868, p. 10.